ROYAL BOTANIC GARDENS, KEW.

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MISCELLANEOUS INFORMATION.

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XVI.—DIONCOPHYLLUM.

T. A. Sprague.

The remarkable climbing shrub described by Baillon in 1890 under the name *Dioncophyllum Thollonі** was originally discovered by M. Thollon in the Niari district, French Congo,† and was not found again until 1914, when flowerless shoots of it were collected by Mr. N. W. Thomas in Sierra Leone, 1800 miles away. These shoots long defied classification, and were only identified through the writer's attention being arrested accidentally by the apt generic name *Dioncophyllum*, which at once recalled the peculiar two-hooked leaves.

The following description‡ and figure are being published in the hope that further material of *Dioncophyllum* may be received from Forestry Officers or others interested in West African botany. Flowering shoots, fruits and ripe seeds are more especially desired, though specimens in any stage of development will be welcome. Care should be taken in drying the fruits to ensure their remaining attached to the leafy branchlets.

Dioncophyllum Thollonі, *Baillon.*—A climbing soft-wooded shrub, apparently glabrous to the naked eye, but bearing numerous minute rust-coloured peltate scales, especially on the youngest parts. Branches (long-shoots) long and slender, terete, slightly glossy, bearing small leaves (2–3½ in. long, ⅓–¾ in. broad), each of which has a pair of strong revolute hooks at its apex, separated from the leaf-blade by a short stalk. In the axils of these hooked leaves are borne much contracted short-shoots, ¼–½ in. long, bearing 4–6 larger leaves (4–6 in. long, ¾–1 in. broad), obtuse at the apex and unprovided with hooks. Leaves alternate, shortly petioled, oblanceolate, entire, smooth; midrib well-marked on both surfaces, very prominent on the upper; lateral nerves numerous, fine, parallel, spreading, rather indistinct, even in a dried state, and probably not visible in the fresh leaf. The inflorescence is carried up the shoot, and does not arise from a leaf axil but laterally, or almost opposite a leaf. It is a loose irregularly branched cyme, without either bracts or bracteoles. Flowers hypogynous. Calyx short, 5-angled, 5-toothed. Petals, 5, contorted. Stamens

* Bull. Soc. Linn. Par. vol. ii. p. 870.

† Engl. Jahrb. vol. xl. p. 486 (1908).

‡ The description of the vegetative parts has been drawn up from Mr. Thomas's specimens, whilst that of the inflorescence and flowers is taken from Baillon.

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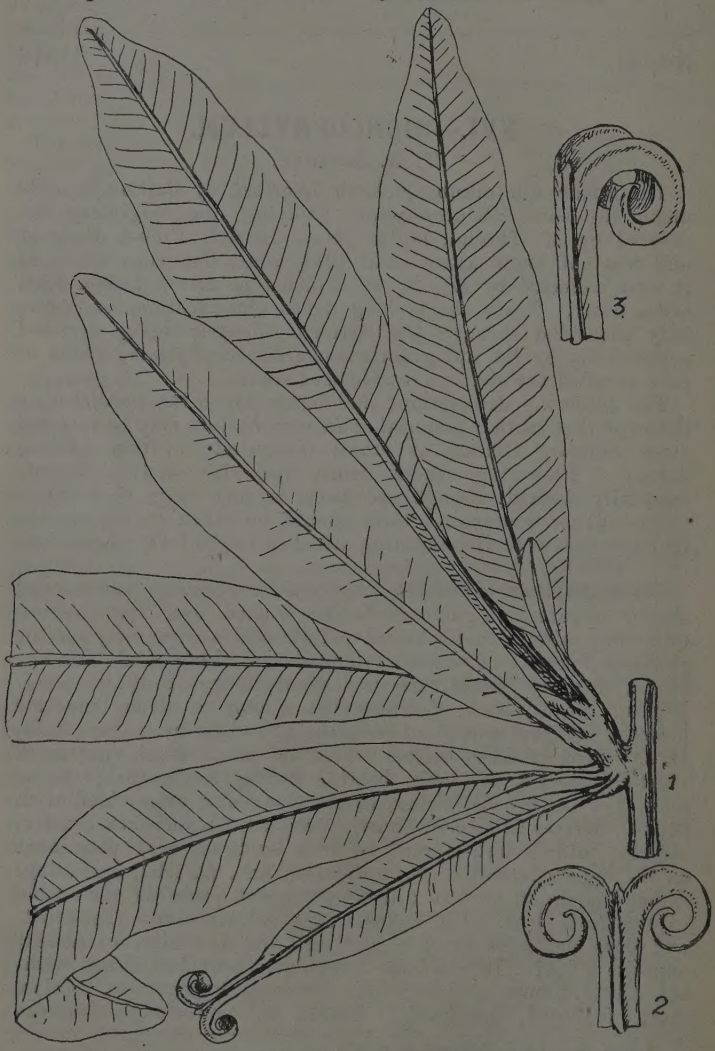
numerous, free; filaments slender; anthers basifixed, elongated, bilocular. Ovary unilocular; styles 5, each terminated by a globose stigma; placentae 5, parietal, each bearing numerous ovules. Ovules distant, transversely or obliquely inserted, anatropous. Fruit and seeds not yet known.



1. A portion of a branch with a small leaf terminated by a pair of revolute hooks. In the axil is a short leafy shoot.
2. The revolute hooks, front view.
3. The revolute hooks, in side view, showing the stalk, prominent midrib, and apical cusp.

Though it has not been possible to examine the type of *Dioncophyllum Tholloni* there can be little doubt that the Sierra Leone plant is conspecific with it. It is true that Baillon described *D. Tholloni* as quite glabrous, but the peltate scales are minute, and though readily observable through a lens on the youngest parts of the short-shoots, soon disappear, either falling off or being rubbed off. Thollon's material apparently did not include short-shoots, as Baillon made no mention of them or of leaves unprovided with an apical pair of hooks.

Before dealing with the systematic position of *Dioncophyllum* it is desirable to attempt a morphological interpretation of its peculiar leaves. On careful examination of the hooked leaves (leaves of the long-shoots), a minute cusp can be seen at the apex, between the two hooks. The leaf can be described empirically as consisting of the following parts from the base upwards: 1, petiole; 2, lamina; 3, a produced portion of the midrib, narrowly winged, and terminated by a minute cusp, each wing of the produced midrib passing outwards from the base of the cusp into an indurated revolute hook.

If the leaf is simple and the apparent lamina is a true lamina, then we have a case of apical bifurcation of the lamina and the conversion of each branch of it into a hooked tendril. If, on the other hand, the leaf is compound, the apparent lamina may be interpreted as a winged petiole,* the hooks as representing lateral leaflets (or their petiolules) and the apical cusp as a terminal leaflet (or its petiolule) or a reduced rhachis. The latter view commends itself to the writer.

According to Baillon, *Dioncophyllum* forms a connecting link between the Bixaceae (Flacourtiaceae) and the Passifloraceae. Warburg placed it provisionally in the Flacourtiaceae-Euscolopieae, but stated that the presence of tendrils suggested Passifloraceae;† Gilg also referred it to the Flacourtiaceae, but regarded it as representing a new group of that family.‡

As the only material of *Dioncophyllum* in the Kew Herbarium consists of two flowerless shoots, the details of the floral morphology cannot at present be confirmed. Judging from Baillon's description, however, the genus should be referred to the Passiflorales,§ but cannot yet be assigned to any family. With a view to ascertaining its affinities Miss F. M. Scott very kindly undertook an examination of the anatomy of the stem and leaf, and her report thereon is appended. Although it proved to be impossible to determine the systematic position of *Dioncophyllum* by means of its anatomical characters; the presence of cortical bundles and internal phloem afford some confirmation of the view that the genus is referable to the Passiflorales, as the former occur in Turneraceae and Begoniaceae,

* This interpretation is in keeping with the great prominence of the midrib on the upper surface of the leaf.

† Engl. & Prantl. Nat. Pflanzenfam. vol. iii. 6A, p. 30 (1893).

‡ Engl. Jahrb. vol. xl. p. 486 (1908).

§ Sensu lato, including Flacourtiaceae, Bixaceae, Cochlospermaceae, Violaceae and Cistaceae in addition to the families referred to it by Bentham and Hooker. The removal of the Cucurbitaceae to the Gamopetalae by Engler does not appear to be justified.

and the latter is characteristic of Cucurbitaceae.* The presence of peltate scales lends further weight to this view, as they have been recorded for Flacourtiaceae, Bixaceae, Cistaceae, Begoniaceae and Datiscaceae.

The great resemblance which *Dioncophyllum* bears to *Nepenthes* should also be kept in mind as possibly indicative of a remote affinity with the Sarraceniales. The lamina-like organ terminated by a double tendril (there is only one tendril in *Nepenthes*), the presence of peltate scales, and the extra-axillary ebracteate inflorescence suggest an affinity with *Nepenthes*, but the floral characters are very different. The fruit and seeds, when known, will probably shed light on the relationships of this remarkable plant.

The Anatomy of Dioncophyllum.

Miss F. M. Scott.

From a study of the anatomical features it has been impossible to determine the systematic position of *Dioncophyllum*. Indeed, the family with which it shows the most agreement, viz., the Melastomaceae, is far removed from it in floral morphology.

The most important characters of the stem are the presence of both cortical bundles and internal phloem. The cortex is differentiated into (1) an outer compact tanniferous layer; (2) a fibrous layer; (3) an inner layer of loose parenchyma. In the fibrous ring run the cortical bundles. These were sixteen in number in the stem examined. They vary considerably in size. They are collateral and inversely orientated. The inner cortex is composed of large and small polygonal cells, the latter containing tannin. The pericycle contains a number of scattered fibres. Sieve tubes and companion-cells were recognised in both inner and outer phloem, but no fibres are present. The wood-fibres of the xylem have bordered pits. The vessels are large and have simple perforations and bordered pits towards parenchyma. The medullary rays are uniseriate. The pith is loose in texture and is strengthened by the presence of stone-cells. Tannin and calcium oxalate are abundant.

The two kinds of leaves, *i.e.*, those on the short and long shoots, appear to be identical in structure. They are bifacial but tend to be centric. The prominent midrib is strengthened above and below by arcs of sclerenchyma, which almost form a complete ring. In these arcs, in the same relative position as in the middle cortex of the stem, lie collateral vascular bundles, inversely orientated. The central bundle of the midrib is supported by a ring of fibres. From the herbarium material examined it was impossible to determine whether this bundle was bicollateral or collateral. The stomata are surrounded by ordinary epidermal cells in no definite arrangement. Calcium oxalate is present in the epidermis.

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* Solereder, Syst. Anat. Dicot., Engl ed., pp. 383, 389.

XVII.—DIAGNOSES AFRICANAE: LXVI.

1571. **Struthiola recta,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 37, anglice [Thymelaeaceae-Euthymelaeeae]; affinis *S. virgatae,* Linn., foliis linearibus calycisque lobis acutis differt.

Caulis erectus, apice sparse ramosus, primum pilosus, demum glaber et cinerascens. *Folia* opposita, linearia, obtusa, 8 mm. longa, 0·3 mm. lata, primum sparse pilosa, mox glabra. *Flores* in foliorum superiorum axillis posita. *Calycis* tubus pubescens, 1·2 cm. longus, tenuis, curvatus; lobi oblongi, acuti, 3 mm. longi, 0·3 mm. lati. *Petala* 8, clavata, 1 mm. longa, pilis circumdatis breviora. *Antherae* breviter apiculatae. *Ovarium* oblongum, 2 mm. longum, glabrum; stylus filiformis, 8 mm. longus; stigma penicillatum.

South Africa. Swellendam Div.; Swellendam, 240–610 m., *Mund* 25.

1572. **Struthiola confusa,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 38, anglice [Thymelaeaceae-Euthymelaeeae]; species *S. virgatae,* Linn.; proxima, foliis lineari-lanceolatis differt.

Suffrutex erectus, e basi multiramosus. *Rami* primum pilosi. *Folia* lineari-lanceolata, obtusa, 6 mm. longa, apice pilorum penicillo instructa, ciliata, mox glabrescentia. *Flores* in foliorum summorum axillis dispositi; bracteolae vix 3 mm. longae, oblongae, obtusae, ciliatae. *Calycis* tubus sparse pubescens, 1·2 cm. longus, supra gradatim dilatatus; lobi ovati, obtusi, 3 mm. longi, 1·5 mm. lati. *Petala* 8, quam calycis lobi dimidio breviora, pilis aequilongis circumdata *Antherarum* connectivum obtusum, breviter productum. *Ovarium* oblongum, glabrum; stylus filiformis; stigma penicillatum.

South Africa. Tulbagh Div.; mountains near the waterfall, 360 m., *Bolus* 5263, *Pappe;* Witzen Berg, behind Steendahl, 610 m., *Bolus* 5378. Cape Div.; beyond Raapenberg Vley, *Wolley-Dod* 340.

This species resembles *S. erecta,* Linn., but differs in having a pubescent calyx with obtuse lobes.

1573. **Struthiola leiosiphon,** *Gilg* ex *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 38, anglice [Thymelaeaceae-Euthymelaeeae]; species *S. rigidae,* Meisn., affinis, calycis tubo multo longiori differt.

Suffrutex multiramosus. *Rami* primum pubescentes, demum glabri et foliorum cicatricibus prominentibus scabri. *Folia* lanceolata, concava, 1·2 cm. longa, 3 mm. lata, primum pilosa, demum glabra et in dorso tuberculata. *Flores* in foliorum summorum axillis posita; bracteolae 6 mm. longae, 1 mm. latae, dense ciliatae. *Calycis* tubus glaber, 2·4 cm. longus, 0·3 mm. diametro, cylindricus; lobi ovati, acuminati, 5 mm. longi, 2·5 mm. lati. *Petala* 12, fere 2 mm. longa, oblonga, pilis vix aequilongis circumdata. *Ovarium* 2 mm. longum, oblongum, glabrum; stylus filiformis, 1·8 cm. longus; stigma parvum.

South Africa. Caledon Div.; tops of the mountains of Baviaans Kloof, near Genadendal, *Burchell* 7730.

1574. **Struthiola ramosa,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 39, anglice [Thymelaeaceae-Euthymelaeeae]; species *S. Mundtii,* Eckl., affinis foliis oblongo-lanceolatis obtusis differt.

Suffrutex multiramosus. *Rami* primum pubescentes, demum glabri, foliorum cicatricibus parvis scabri. *Folia* oblongo-lanceolata, 7 mm. longa, 2 mm. lata, dense albociliata, demum glabra, siccate longitudinaliter sulcata. *Flores* in foliorum superiorum axillis dispositi; bracteolae 2 mm. longae, oblongae, costa valida et marginibus membranaceis praeditae. *Calycis* tubus glaber, 1 cm. longus, supra leviter inflata costataque; lobi ovati, obtusi, 2 mm. longi. *Petala* 12, oblonga, 1·5 mm. longa, pilis aequilongis circumdata. *Ovarium* oblongum, glabrum; stylus filiformis, calycis tubo aequilongus; stigma penicillatum.

South Africa. Without precise locality, *Mund.* Tulbagh Div.; Witzenberg Range, *Zeyher.*

1575. **Struthiola Galpini,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 39, anglice [Thymelaeaceae-Euthymelaeeae]; species *S. Mundtii,* Eckl., affinis, ramis primum pubescentibus (nec villosis) differt.

Rami primum pubescentes, demum glabri, leviter cicatricosi. *Folia* approximata, lanceolata, acuta, 7 mm. longa, 2 mm. lata, primum dense albociliata, demum glabra nitidaque. *Flores* in foliorum summorum axillis congesti; bracteolae ovatae, acutae, 2 mm. longae, 1·5 mm. latae, dense ciliatae, herbaceae. *Calycis* tubus glaber, 1·2 cm. longus, leviter curvatus, supra gradatim expansus; lobi ovati, subacuti, 3 mm. longi, 1·5 mm. lati, tenues. *Petala* 12, quam calycis lobi dimidio breviora, pilis aequilongis circumdata. *Antherarum* connectivum acutum. *Ovarium* oblongum, glabrum; stylus filiformis, 8 mm. longus; stigma penicillatum.

South Africa. Riversdale Div.; Milkwoodfontein, 180 m., *Galpin* 4508.

1576. **Struthiola Garciana,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 40, anglice [Thymelaeaceae-Euthymelaeeae]; species ex affinitate *S. Martianae,* Meisn., a qua foliis oblongis obtusis differt.

Caulis erectus, simplex vel parce ramosus, primum pilosus, rubescens. *Folia* oblonga, obtusa, 1·2 cm. longa, 2 mm. lata, primum dense albociliata, coma alba terminata. *Flores* in foliorum superiorum axillis positi; bracteae 1·2 cm. longae, 2·3 mm. latae, lanceolatae, acuminatae, dense albociliatae. *Calycis* tubus pubescens, 2 cm. longus, 1 mm. diametro, cylindricus; lobi lanceolati, acuminati, 3 mm. longi, 1 mm. lati, extra pubescens. *Petala* 12, clavata, 2 mm. longa, pilis aequilongis circumdata. *Antherae* oblongae, acuminatae, 2 mm.

longae. *Ovarium* oblongum, 1 mm. longum, glabrum; stylus filiformis; stigma penicillatum.

South Africa. Riversdale Div.; near Garcias Pass, *Burchell* 7152. Humansdorp Div.; Kruisfontein, near Humansdorp, *Galpin* 4510.

1577. **Struthiola fasciata,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 41, anglice [Thymelaeaceae-Euthymelaeeae]; species ex affinitate *S. tomentosae,* Andr., a qua calycis tubo multo breviore differt.

Suffrutex fasciculatim ramosus; rami primum dense lanati; foliorum cicatrices vix prominentes. *Folia* opposita, linearia, obtusa, 7 mm. longa, vix 1 mm. lata. *Flores* in foliorum summorum axillis positi, foliis paullo longiores; bracteae lanceolatae, acutae, marginibus densissime lanatis. *Calycis* tubus 7 mm. longus, pubescens; lobi ovati, acuti, 2 mm. longi, 1·5 mm. lati. *Petala* 12, oblonga, subacuta, pilis circumdatis paullo longiora. *Antherae* apiculatae. *Ovarium* oblongum, glabrum; stylus filiformis; stigma parvum.

South Africa. Swellendam Div.; between Zuurbraak and Buffelsjagts River Drift, *Burchell* 7266.

1578. **Gnidia orbiculata,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 47. anglice [Thymelaeaceae-Euthymelaeeae]; species distinctissima ex affinitate *G. oppositifoliae,* Linn., a qua foliis orbicularibus differt.

Frutex erectus, corymbose ramosus; rami erecti, glabri. *Folia* opposita, orbicularia, 4–6 mm. diametro, breviter cuspidata, uninervia, glabra. *Flores* ad ramorum apicem pauci. *Calyx* extra tomentosus, citrinus; tubus 1·6 cm. longus, subcylindricus, costatus; lobi orbiculares, 3 mm. diametro. *Petala* 4, antheris simulantia, crassa, 1·3 mm. longa, breviter unguiculata. *Antherae* oblongae, obtusae, 1·3 mm. longae.

South Africa. Uniondale Div.; in damp places by the Aapies River, in Long Kloof, *Burchell* 4945. Without locality, *Thom* 162.

1579. **Gnidia quadrifaria,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 50, anglice [Thymelaeaceae-Euthymelaeeae]; *G. styphelioidi,* Meisn., affinis, foliis anguste lanceolatis stricte quadrifariis distinguitur.

Frutex ramosissimus; rami tenues, rubescentes, primum pubescentes, foliorum cicatricibus subprominentibus. *Folia* approximata, subopposita, anguste lanceolata, acuminata, 1 cm. longa, fere 2 mm. lata, subtus trinervia, distincte quadrifaria, glabra, marginibus parte superiore inflexis. *Flores* pauci ad ramorum apicem positi. *Calyx* flavus, extra pubescens; tubus 8 mm. longus; lobi ovato-lanceolati, 4 mm. longi, 2 mm. lati. *Petala* 4, membranacea, 3 mm. longa, 2 mm. lata. *Antherae* oblongae, 1 mm. longae, superiores exsertae filamentis 1 mm. longis instructae. *Ovarium* oblongum, apice pilosum; stylus calycis tubo fere aequilongus; stigma capitatum.

South Africa. Humansdorp Div.; Kruisfontein Mountains, 300 m., *Galpin* 4518.

1580. **Gnidia myrtifolia,** *C. H. Wright* in Dyer, Fl. Cap. vol. v. sect. 2, p. 51, anglice [Thymelaeaceae-Euthymelaeeae]; species ex affinitate *G. styphelioidis*, Meisn., foliis ovatis acuminatis differt.

Frutex dense ramosus; rami breves, tenues, rubescentes, primum hirsuti, mox glabrescentes, foliorum cicatrices parvae. *Folia* opposita, approximata, ovata vel ovato-oblonga, 1 cm. longa, circiter 4 mm. lata, acuminata, coriacea, glabra marginibus verrucosis parte superiore exceptis, 3–5-nervia. *Flores* pauci ad ramorum apicem positi. *Calyx* extra pubescens; tubus 1 cm. longus, anguste infundibuliformis; lobi ovato-lanceolati, apice acuti incrassatique, 4 mm. longi, 2 mm. lati. *Petala* 4, membranacea, 2 mm. longa, 1·5 mm. lata. *Antherae* oblongae, obtusae, vix 1 mm. longae, superiores filamentis 1 mm. longis praeditae. *Ovarium* ovoideum, apice pilosum; stylus quam calycis tubus longior, crassus; stigma papillosum.

South Africa. East London Div.; plains near Cove Rock, East London, 15 m., *Galpin* 3177; hill near Kwenquea River Mouth, 90 m., *Galpin* 5803.

XVIII.—USEFUL WOODS OF CORNACEAE.

W. Dallimore.

The family *Cornaceae* is not a very important one from an economic standpoint, although it includes several genera which provide useful timber trees and a number of species that possess medicinal properties. The uses of the wood of various species of *Cornus* are enumerated in *K.B.* 1915, pp. 179–181 and the succeeding notes indicate the more important timber trees of other genera.

Curtisia faginea, *Aiton.*—Hassagay-wood, Assegai-wood, Assegai-hout, Assagay-boom, Cape Lancewood.

This is one of the most useful hardwoods of South Africa, where it usually occurs as a small tree 20–40 ft. high with a diameter of 12–18 in., although it sometimes grows 60 ft. high with a diameter of 2 ft. It is present in all the Cape forest districts as well as in Natal and the Transvaal, young trees from cut-over stumps or from naturally-sown seeds being plentiful, though mature trees in easily accessible places are scarce. Its leaves are evergreen, opposite, oval or elliptical, with deeply-toothed margins, 1–3 in. or more long and 1–2 in. wide. The flowers are small and have no decorative merit. The wood is tough, heavy (sometimes 60 lbs. to the cubic foot), close-grained, durable, and capable of taking a good finish and polish; sap-wood yellowish and heart-wood red or brown. T. R. Sim, "Forest Flora of Cape Colony," p. 231, says that it makes very durable and superior furniture, tools, etc. With regard

to its use for spokes and felloes he adds that it is more constantly in demand than any other kind. Specimens of the wood, with polished turnery work and an assegai shaft, are to be seen in Museum No. I at Kew, and in Museum No. III there is a plank 18½ in. wide.

Griselinia littoralis, *Raoul.*—Papauma.

Two species of *Griselinia*, natives of New Zealand, are grown in the British Isles, but neither one attains timber size here. *G. littoralis* is a handsome evergreen tree 40–60 ft. high in New Zealand, with a trunk 2–4 ft. in diameter. The leaves are usually broadly oval, thick in texture, yellowish-green in colour, and 2–3 in. long. Male and female flowers are borne by different trees, the former being yellow, the latter green. The fruits are as large as garden peas and dark purple or almost black in colour. Kirk, "Forest Flora of New Zealand," pp. 69–70, says that the timber is very durable and of considerable value notwithstanding its small dimensions, for it is rarely obtained in greater lengths than 12 ft., on account of the crooked character of the trunk. It is dense, firm, compact, slightly brittle although of great strength, reddish in colour, shrinks very little in drying and is used for house-blocks, fencing-posts, sleepers, boat and ship timber, and other purposes. It is sometimes used for inlaying but is not in demand for cabinet-work. In the warmer parts of the British Isles it forms a fine bush 12–20 ft. or more high and reproduces itself from seed.

G. lucida, *Forster.*—Puka.

This is of smaller dimensions than the last-named for, in New Zealand, according to the conditions under which it is growing, it reaches maturity at heights varying from 3–30 ft., the trunk diameter of the best examples being rarely more than 12 in. In its native country it is both epiphytal and terrestrial in its habits; some plants begin life as epiphytes, and after sending roots down from their support to the soil, continue and end their life as terrestrials. Its leaves are oval or elliptical, 3–7 in. long and half as wide, dark glossy green, and thick in texture. Kirk, l.c., pp. 67–68, says that the wood, though small, is dense, compact and very durable, being used for posts, millwrights' work and other purposes. It is usually brownish in colour. In the British Isles it is less hardy than *G. littoralis*, but grows well in the warmer parts of Devonshire and Cornwall.

Nyssa sylvatica, *Marshall.*—Tupelo, Tupelo gum, Sour gum, Black gum, Yellow gum, Pepperidge, Stinkwood, Hazel pine, Bay poplar.

This is an important North American tree distributed over a wide range of country from S. Canada to Florida and Texas. It usually occupies wet or moist land, often growing in swamps and marshes with *Liquidambar styraciflua*. Under favourable conditions it averages 60–65 ft. in height, with a trunk diameter of 2½–3½ ft., but is sometimes upwards of 100 ft. high. The leaves are deciduous, oval, 3–4 in. long, glossy, and become brilliantly coloured in autumn. The wood is light, soft but tough,

splits badly, planes well and is used for hubs of wheels, interior finish of houses, backs and drawers of cabinets, boxes and for other purposes for which canary white wood or yellow poplar (*Liriodendron Tulipifera*) can be used, in fact there is a certain resemblance between the wood of the two trees. The sap-wood is pale yellow, and the heart-wood light brown. Hough, "American Woods," i, No. 9, pp. 53–54, gives a good account of the wood and its uses. In addition to its use in the United States it is exported to the British Isles and other countries.

Other American Nyssas that provide useful timber are *N. biflora*, Walters, Water gum, Black gum or Water tupelo, which Sargent includes as a variety of *N. sylvatica; N. Ogeche*, Marshall,—the Ogeche lime, Gopher plum, or Sour tupelo; and *N. aquatica*, Marshall, the Cotton gum or Tupelo gum. The timber of these trees is very like that of *N. sylvatica*, and is used for similar purposes. Descriptions of the various American Nyssas are given by Sargent in his "Silva of N. America, v, pp. 73–84."

N. sessiliflora, *Hooker*, is a large evergreen tree native of the Himalaya. Its wood does not appear to have been used for any special purpose.

Marlea vitiensis, *Bentham.*—Musk-tree.

Specimens of the wood of this Australian tree are to be seen in Museum No. I at Kew. The sap-wood is bright yellow, and the heart-wood dark brown or black, the sap-wood being greatly in excess of the heart-wood. It is close-grained and has the appearance of being a good cabinet wood, or it might be used for turnery. Maiden, in "Useful Native Plants of Australia," p. 568, says that it forms a tree 20–30 ft. high, with a trunk 6–12 in. in diameter, when growing in New South Wales and Queensland.

Alangium Lamarckii, *Thwaites* = *A. decapetalum*, Lamarck.

A small tree or shrub widely distributed in S. India, Ceylon, the Malay Peninsula, Philippine Islands and other countries. The wood, though of small size, is heavy, close-grained, strong and of good appearance, the sap-wood yellow and the heart-wood brown. It has been used in Madras for pestles, oil-mills, and other purposes. Drury, "The Useful Plants of India," 1873, p. 24, says that the juice of the root is credited with anthelmintic and purgative properties, and that it is employed in dropsical cases, and, pulverised, is a reputed antidote for snake-bites.

Mastixia arborea, *C. B. Clarke.*

This is a large-growing evergreen tree native of S. India and Ceylon. The wood is said to be soft and greyish in colour, but it appears to be in small demand. *M. pentandra*, Blume, from the forests of Western India also produces a greyish wood which is soft but of good appearance. A specimen of the last-named may be seen in Museum No. I, at Kew.

Toricellia tiliaefolia, *DC.*

According to Gamble, "A Manual of Indian Timbers," p. 392, this is a tree with white, even-grained, moderately hard

wood, native of the Eastern Himalaya. He says that it is a small tree at Darjeeling, but refers to S. E. Peal as saying that it grows to an immense size in Assam, 60–70 ft. to the first branch, and up to 20 ft. in girth, the wood being used for tea boxes.

Garrya elliptica, *Douglas.*—Silk-tassel-tree, Quinine-tree.

This Western N. American shrub or small tree is grown in the British Isles for the sake of its evergreen leaves and long, pendent catkins of yellowish-green flowers which develop during winter. The wood has little value, although Britton, "North American Trees," p. 736, says that it is sometimes used for fancy cabinet work, and adds that it is hard, close-grained, greyish-brown, and polishes well but checks badly. It is found from Monterey northwards to the Columbia River, as a shrub or small tree up to 20 ft. high.

Aucuba himalaica, *Hooker,* and **A. japonica,** *Thunberg.*

Although the former species sometimes grows to the dimensions of a small tree in the Himalaya, both are better known as large evergreen bushes. The wood is sometimes 6–9 in. in diameter, and its chief use appears to be firewood. In Museum No. I at Kew, tooth-picks are to be seen made from the wood of *A. japonica.*

Corokia buddleoides, *A. Cunningham.*

Of the several species of *Corokia* this is probably the most vigorous. It is a native of New Zealand, where it forms an evergreen, yellow-flowered shrub or tree 10–14 ft. high. The wood does not appear to possess any special value although it is hard, close-grained and of good appearance.

XIX.—NOTES ON AFRICAN COMPOSITAE : I.

J. Hutchinson.

Schistostephium, *Less.*

Three species of this genus, *Schistostephium hippiaefolium* (DC.), *S. heptalobum,* Oliv. & Hiern, and *S. griseum* (Harv.) were included by Harvey in the Flora Capensis (following DeCandolle) in the genus *Tanacetum,* L. But as Bentham* has pointed out they all differ from *Tanacetum* proper in having 4-lobed and not 5-lobed corollas in the hermaphrodite flowers, and they agree in every respect, except a trivial distinction in the sexes, with the genus *Schistostephium,* Less. As thus limited *Tanacetum* is entirely boreal, and *Schistostephium* South and South-tropical African in distribution. The latter genus is represented in Harvey & Sonder's Flora Capensis, vol. iii. p. 168, by three species, *S. flabelliforme,* Less., *S. rotundifolium,* Fenzl, and *S. crataegifolium,* Fenzl. To these are now added the three

* Benth. et Hook. f. Gen. Pl. ii. 432.

above mentioned, *S. oxylobum*, S. Moore, from Gazaland, and five new species here described.

CLAVIS SPECIERUM.

Capitula solitaria, longissime pedunculata — 1. *S. griseum.*
Capitula corymbosa: —
  Folia petiolata, flabellatim lobulata vel dentata: —
    Foliorum lobuli vel dentes rotundati; lamina dense sericea; corollae ♂ glabrae ... ... — 2. *S. flabelliforme.*
    Foliorum lobuli vel dentes triangulares, plerumque acuminati; lamina pubescens; corollae ♂ glandulosae — 3. *S. rotundifolium.*
  Folia sessilia, pinnatim vel palmatim partita vel lobata: —
    Folia dense sericeo-villosa: —
      Foliorum segmenta lata; flores ♀ distincte 4-lobati ... ... — 4. *S. villosum.*
      Foliorum segmenta angustissima; flores ♀ imperfecte 2–3-dentati — 5. *S. crataegifolium.*
    Folia breviter pubescentia vel glabra: —
      Folia palmatim lobata vel partita, lobis ascendentibus: —
        Capitula 3–4-nata; pedunculi ultimi gracillimi, circiter 2 cm. longi ... ... — 6. *S. Rogersii.*
        Capitula numerosa; pedunculi ultimi robusti, 3–6 mm. longi: —
          Caulis dense molliter tomentosus; capitula 5 mm. diametro ... — 7. *S. mollissimum.*
          Caulis appresse puberulus; capitula 8 mm. diametro ... ... — 8. *S. dactyliferum.*
      Folia pinnatim lobata vel partita, lobis a costa sub angulo 90° abeuntibus: —
        Foliorum lobi integri: —
          Foliorum loborum sinus latus, apertus, lobis marginibus parallelis — 9. *S. saxicola.*
          Foliorum loborum sinus angustus, lobis marginibus curvatis ... — 10. *S. heptalobum.*
        Foliorum lobi dentati vel lobulati: —
          Foliorum lobi utrinque numerosi, lobo terminali parvo ... — 11. *S. hippiaefolium.*
          Foliorum lobi utrinque circiter 3, lobo terminali magno flabellato ... ... — 12. *S. oxylobum.*

1. **S. griseum,** *Hutchinson,* comb. nov.
Tanacetum griseum, Harv. in Harv. et Sond. Fl. Cap. iii. 168 (1865).

South Africa.—Eastern Region:* East Griqualand; stony places on Botha's Hill, 800 m., Oct., *Medley Wood* 1479; rough places around Clydesdale, 800 m., Dec., *Tyson* 1066, 2172. Natal: Eastcourt, *Rehmann* 7319; near Gourton, Little Tugela River, Dec., *Medley Wood* 3667; without definite locality, *Gerrard* 1050.

2. **S. flabelliforme,** *Less.* Syn. Comp. 251 (1832); Harv. in Harv. et Sond. Fl. Cap. iii. 168.
Tanacetum argyreum, DC. Prodr. vi. 134 (1837).
Schistostephium argyreum, Fenzl ex Harv. l.c., nomen (1865).

South Africa.—Karroo Region: Somerset East, *Bowker.*
Kalahari Region: Transvaal, *McLea in Herb. Bolus* 5736.
Eastern Region: Albany; amongst grass near Grahamstown, 700 m., Apr.–May, *MacOwan* 530. Cathcart: amongst rocks on Amatola Mt., May, *Tyson* 1067. Stockenstrom: Katberg, *Shaw.* Tembuland: between Morley and Umtata River, grassy heights, 320–640 m., May, *Drège b.*

3. **S. rotundifolium,** *Fenzl* ex Harv. in Harv. et Sond. Fl. Cap. iii. 169 (1865); Oliv. et Hiern in Oliv. Fl. Trop. Afr. iii. 399.
Tanacetum rotundifolium, DC. Prodr. vi. 133 (1837); Drège, Zwei Pflanzengeogr. Docum. 152.

South Africa.—Kalahari Region: "New Caledonia," Drakensberg, *McLea in Herb. Bolus* 3007. Transvaal: near Lydenburg, Dec.–Jan., *Atherstone.*
Eastern Region: Swaziland; high veld near Dalriach, Mbabane, 1550 m., Dec., *Bolus* 12019. Natal: Inanda, July, *Medley Wood* 139; Friedenau Farm, Alexandra distr., May, *Rudatis* 649; "Natal," *Gerrard* 1052. Pondoland: between Omsamwubo and Omsamcaba, rocky places and forests margins below 330 m., May, *Drège.*

4. **S. villosum,** *Hutchinson,* sp. nov.

Suffrutex circiter 4·5 dm. altus; caulis erectus, sulcatus, dense villosus. *Folia* sessilia, ambitu obovata vel oblongo-oblanceolata, pinnatilobata, 3–5 cm. longa, 2·5–3 cm. lata, chartacea, utrinque sericeo-villosa, lobis ovatis acutis circiter 5 mm. longis et 3–4 mm. latis; nervi laterales utrinque prominentes. *Capitula* homogoma, numerosa, laxe corymbosa; pedunculi usque ad 1 cm. longi, sericei. *Involucra* subturbinato-campanulata, apice 7–8 mm. diametro; bracteae circiter 4-seriatae, lineari-subulatae, ab extremo sensim longiores, usque ad 4·5 mm. longae, dense cinereo-sericeae. *Flores* numerosissimi; corollae tubus leviter ampliatus, 2·5 mm. longus, superne extra minute glandulosus; lobi 4,

* South African regions according to Bolus, Sketch of the Floral Regions of South Africa (Science in South Africa, 1905).

triangulares, obtusi, 0·75 mm. longi; achaenia 1·5 mm. longa, glabra.

South Africa.—Kalahari Region: Orange River Colony; *Cooper* 2523.

Eastern Region: Natal; Drakensberg, Biggarsberge, *Rehmann* 7084; without definite locality, *Gerrard* 1051. Zululand: 1330–1660 m., Mar., *Wylie in Herb. Medley Wood* 8841. Swaziland: grassy slopes at Hlatikulu, *Stewart* 77.

In herbaria this species will be found confused with *S. crataegifolium*, Fenzl., a plant with deeply cut narrow delicate leaves and much smaller flower heads.

5. **S. crataegifolium,** *Fenzl* ex Harv. in Harv. et Sond. Fl. Cap. iii. 169 (1865).

Tanacetum crataegifolium, DC. Prodr. vi. 134 (1837). *T. consanguineum*, DC. l.c.

Schistostephium artemisiaefolium et *S. microcephalum*, Baker in Kew Bull. 1897, 270.

S. Homblei, DeWild. Études Fl. Katanga, 170 (1913), ex descriptione.

Tropical Africa.—Belgian Congo: Elisabethville, Mar., *Homblé* 228, 292; Kundelungu, Mar., *Kässner* 2582. Nyasaland: Nyika Plateau, 2000–2500 m., July, *Whyte* 225; between Kondowe and Karonga, 600–1800 m. alt., July, *Whyte*.

South Africa.—Upper Region: Albert, *Cooper* 619.

Kalahari Region: Basutoland; Leribé, *Dieterlen* 289. Transvaal: Modderfontein, in the bush, *Conrath* 403; Houtbosh, *Rehmann* 6067; near Lydenburg, Oct., *Wilms* 690.

Eastern Region: Alexandria; between Hoffmanskloof and Drie Fontein, 320–640 m., Nov., *Drège a.* Albany; between Grahamstown and Blue Krantz, Sept., *Burchell* 3619; amongst shrubs near Grahamstown, *MacOwan*. East Griqualand; in rocky places around Clydesdale, flowers yellow, Mar., *Tyson* 3159; rocky hills around Kokstad, Mar., *Tyson* 454. Tembuland; Baziya, Feb., *Baur* 80. Natal; amongst grass at Umzumbi, Afr., *Medley Wood* 3109; "Natal," *Gerrard* 435; *Cooper* 3504.

6. **S. Rogersii,** *Hutchinson*, sp. nov.

Herba basi lignosa, erecta, superne bi- vel trifurcata; caulis cortice brunneo parce puberulo obtectus; rami graciles, leviter flexuosi, straminei, puberuli. *Folia* sessilia, basi cuneata, ad medium vel fere ad medium digitatim 3–5-lobata, 1·5–2 cm. longa, 1–1·5 cm. lata, utrinque praesertim in nervis parce pubescentia, punctata, lobis lanceolatis acutis 2–3 mm. latis 1-nervis. *Capitula* heterogama, 2–4-corymbosa, terminalia, pedunculata, campanulata, 5 mm. longa, circiter 6 mm. diametro; pedunculi gracillimi, 1·5 cm. longi, minute puberuli. *Involucri* bracteae 4-seriatae, exteriores subulato-lanceolatae, acutae, interiores lineares vel oblanceolatae, subacutae, extra superne parce pubescentes. *Flores* ♀ pauci; corolla imperfecte 3-lobata. *Flores* ♀

numerosi; corollae tubus 2 mm. longus, angularis, in angulis glandulosus, 4-lobatus, lobis ovatis obtusis 0·75 mm. longis. *Achaenia* 1·5 mm. longa, minute papillosa.

Tropical Africa.—North-West Rhodesia: Choma, 1120 m. May, *Rogers* 8022.

7. **S. mollissimum,** *Hutchinson,* sp. nov.

S. heptalobum, S. Moore in Journ. Linn. Soc. xl. 117 (1911), non Oliv. et Hiern.

Herba lignosa, erecta; caulis superne ramosus, dense molliter tomentosus, subdense foliatus. *Folia* sessilia, breviter palmatim 3–5-lobata, ambitu obovata, 3–3·5 cm. longa, usque ad 2·5 cm. lata, utrinque praecipue in nervis tenuiter pubescentia, punctata, lobis oblongo-lanceolatis subacutis 4–8 mm. longis 3–4 mm. latis marginibus incrassatis leviter recurvatis. *Corymbi* parvi, ramos fere efoliatos terminantes; pedunculi ultimi 3–4 mm. longi, tomentelli. *Capitula* heterogama, turbinato-campanulata, circiter 5 mm. diametro. *Involucri* bracteae 4–5-seriatae, exteriores lineares, interiores lanceolatae, subacutae, usque ad 3 mm. longae, extra appresse pubescentes. *Flores* flavi, exteriores ♀, interiores ♂; corollae tubus florum ♀ 3- vel imperfecte 4-lobatus, florum ♂ 4-lobatus, tubo 1·5 mm. longo angulari in angulis glanduloso, lobis ovatis cucullatis extra glandulosis. *Achaenia* papilloso-glandulosa, 1 mm. longa.

Tropical Africa.—Rhodesia: near Chirinda, 1500 m., May, *Swynnerton* 491.

8. **S. dactyliferum,** *Hutchinson,* sp. nov.

S. heptalobum, Oliv. et Hiern in Oliv. Fl. Trop. Afr. iii. 399, quoad descript. et spec., excl. syn.

Herba lignosa, erecta, apice parce ramosa; caulis sulcatus, appresse puberulus. *Folia* sessilia, palmatim 3–5-lobata, ambitu elliptica vel obovata, 2–4 cm. longa, 2–3 cm. lata, utrinque puberula et punctulata, lobis linearibus vel lineari-lanceolatis subacutis 0·8–1·5 cm. longis 3·5–4 mm. latis 1-nervis. *Capitula* heterogama, dense corymbosa, breviter pedunculata, late campanulata, 8 mm. diametro; pedunculi robusti, 5–6 mm. longi, tomentelli. *Involucri* bracteae 4-seriatae, lanceolatae, plerumque acutae, usque ad 3·5 mm. longae, marginibus leviter membranaceis, extra appresse pubescentes. *Flores* exteriores ♀; corollae tubus breviter 2–3-lobatus, styli ramis breviter exsertis; corolla florum ♂ 4-lobata; tubus 1 mm. longus, glaber, lobis late obtusis 0·75 mm. longis. *Achaenia* appresse papilloso-pubescentia, 2 mm. longa.

Tropical Africa.—Portuguese East Africa: near Sena on the Zambesi, *Kirk.* North-West Rhodesia: Pemba, June, *Rogers* 8266.

9. **S. saxicola,** *Hutchinson,* sp. nov.

Tanacetum hippiaefolium, Drège, Zwei Pflanzengeogr. Docum. 152, non DC.

Herba lignosa usque ad 1 m. alta, e basi ramosa; rami angulares minute puberuli, dense foliati. *Folia* sessilia, ambitu obovata, pinnatipartita, utrinque puberula, 2·5–4 cm. longa, 2–3·5 cm. lata, lobis distantibus sinu lato formantibus oblongo-lanceolatis acutis

usque ad 1·5 cm. longis et 4 mm. latis 1-nervis marginibus parallelis. *Capitula* heterogama, laxe corymbosa, folia superiora multo superantia, pedunculata, turbinato-campanulata, 4 mm. longa, 5 mm. diametro; pedunculi ultimi graciles, 0·5–1 cm. longi, puberulo-tomentelli. *Involucri* bracteae 4-seriatae, ab extremo sensim longiores, usque ad 2·5 mm. longae, lineari-lanceolatae, exteriores acutae, interiores obtusae, extra appresse pubescentes, marginibus submembranaceis. *Flores* aurantiaici, exterioribus paucis ♀. *Florum* ♀ corollae brevissime 4-lobatae, ♂ 4-(rarius 5-) lobatae, extra superne parce glandulosae. *Achaenia* glabra, angularia.

South Africa.—Kalahari Region: Transvaal; Jeppes Town ridges, Johannesburg, 1930 m., Jan.–Feb., *Gilfillan in Herb. Galpin* 6218; Modderfontein, in the bush, *Conrath* 402; Houtbosh, *Rehmann* 6082.

Eastern Region: Transkei; Kentani district, small stiff herb bordering stones, 400 m., May, *Pegler* 1509. Pondoland; between Omsamwubo and Omsamcaba, rocky shady valley near the great Waterfall, below 320 m., May, *Drège*. East Griqualand; moist rocks around Clydesdale, 800 m., Mar., *Tyson* 2744; *Tyson in Herb. Bolus* 867. Natal; Inanda, *Medley Wood* 475; Durban, *Krauss* 149.

In herbaria this species has been associated with *S. heptalobum* (*Tanacetum heptalobum*, DC.), but it seems to be distinct as shown in the key. *S. saxicola* is always noted as growing amongst rocks, whilst *S. heptalobum* favours the banks of streams.

10. **S. heptalobum,** *Oliv. et Hiern* in Oliv. Fl. Trop. Afr. iii. 399 (1877) [quoad syn., excl. descr. et specim.].

Tanacetum heptalobum, DC. Prodr. vi. 133 (1837); Harv. in Harv. et Sond. Fl. Cap. iii. 167.

South Africa.—Kalahari Region: Transvaal; Mac Mac Creek, *Mudd*; between Sabie Falls and Pilgrims Rest, June, *Burtt Davy* 429.

Eastern Region: Pondoland; Umtata River banks, 760 m., Jan., *Kolbe & Pegler* 1599. Natal; between Umbomanzi River and Umlazi River, *Drège;* Dumisa, Alexandra distr., borders of forests, 580 m., Apr., *Rudatis* 949; Inanda, *Medley Wood* 1316; "Natal," *Gerrard* 434.

11. **S. hippiaefolium,** *Hutchinson*, comb. nov.

Tanacetum hippiaefolium, DC. Prodr. vi. 133 (1837).

South Africa.—Eastern Region: Stockenstrom; Katberg, May, *Shaw* 104, 107; 1100–1300 m., July, *Baur* 876. Griqualand East; on hills around Kokstad, 1400 m., June, *Tyson* 1377; 1700 m., *Tyson* 453. Natal; Weenen country, in a valley, 1300 m., Apr., *Medley Wood* 4452; "Natal," *Gerrard* 1959.

12. **S. oxylobum,** *S. Moore* in Journ. Linn. Soc. xl. 117 (1911).

Tropical Africa.—Rhodesia: Mt. Pene; Chimanimani Mts., Sept.–Oct., *Swynnerton* 1871; 6132.

XX.—A NEW CASE OF SYMBIOSIS BETWEEN A BACILLUS AND A PLANT.

(*Preliminary Note.*)

STUDIES FROM THE PATHOLOGICAL LABORATORY.

I.

DR. PETER GEORGEVITCH.

A new case of symbiosis between a bacillus and a plant has been found in *Kraussia floribunda*, Harv., which is cultivated in the Royal Botanic Gardens, Kew.

On the leaves of this plant there are many nodules, the anatomical structure of which is similar to that described for the nodules in the leaves of species of *Pavetta*. The nodules in *Kraussia* are elliptical, and attain a size of 350 μ by 150 μ They are separated from the tissue of the leaf by two or three layers of cells and above them the epidermis is slightly depressed.

The nodule is formed of spongy tissue with many intercellular spaces in which lives a bacillus whose morphology, formation of spores and germination are described in this note.

The bacillus is rodlike in form, 3 μ or 5 μ in height and 1 μ in thickness. It is not mobile and forms on agar (in 24 hours, at a temperature of 33° C.) colonies of 1 or 3 mm. in diameter which are white in colour and opalescent. Single rods prevail but not infrequently there are chains of three or more individuals.

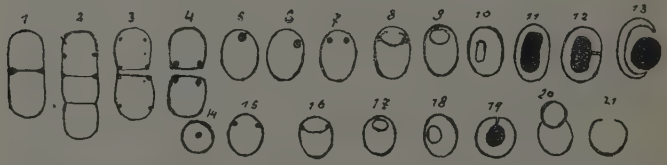
When inoculated from nodules on to potatoes or potato agar the bacillus begins to divide in the following manner. In the middle of the bacillus there appear two similar chromatic granules opposite each other on the lateral walls. By deposition of new chromatic material around these granules towards the centre of the bacillus in a diaphragm-like manner the formation of a transverse wall is completed. This is deeply coloured by a dilute solution of Carbol-Fuchsin and by intra vitam staining (fig 1).

After the formation of the transverse wall the bacillus becomes attenuated in its middle region, whilst the transverse wall itself splits into two laminae. This splitting begins by the division of the two chromatic granules, from which the transverse wall originates and continues towards the middle of the bacillus until the whole transverse wall is divided into two lamellae (fig 3). This is proved by the fact that two smaller chromatic granules are always found on the edges of each lamella which form the transverse wall of the new bacilli (figs. 3, 4), whilst the primary transverse wall originates from only two chromatic granules (figs. 1, 2). The lateral walls of the parent bacillus split at the point between the two newly formed laminae of the transverse wall (fig. 3), and so the daughter bacilli become separated from each other (fig. 4).

The new bacilli formed in this way become more or less oval in form. In the protoplasm appears a chromatic granule which

stains very deeply and is situated either at the pole or laterally below it (figs. 5, 6). Later two chromatic granules are formed on the lateral walls of the bacillus (fig. 7), and by deposition of chromatic material about these, the formation of a transverse wall is completed. By further deposition of chromatic material about these granules towards the pole of the bacillus (fig. 8) a vesicle of chromatin is formed, by which a mass of protoplasm is separated from the remaining content. This is situated close to the pole of the bacillus (fig. 9), and stains very deeply with dilute Carbol-Fuchsin. The vesicle elongates in the direction of the longer axis of the bacillus and becomes rodshaped (fig. 10) and growth continues until the whole interior of the bacillus is occupied (fig. 11). In this stage the rod is not stained by Carbol-Fuchsin, but is highly refractive and is yellowish-green in colour.

The spore of the bacillus formed in this manner is liberated by the splitting of the lateral wall of the sporangium (fig. 12), which opening, becomes sufficiently wide to allow of the escape of the spore (fig. 13).



In older cultures these free spores prevail and are 2–3 μ in length and 1·5–2 μ in width. To these adhere the remains of the split sporangia forming a mass which colours deeply with Carbol-Fuchsin, while the spores themselves do not colour with this stain.

The wall of the germinating spore takes Carbol-Fuchsin very deeply, while its protoplasm is coloured only pale red.

In the middle of a germinating spore a chromatic granule is formed which is coloured very deeply with Carbol-Fuchsin (fig. 14), and as a result of further development two chromatic granules are laid down on the lateral walls (fig. 15). By deposition of new chromatic material about these granules towards the middle of the spores a transverse wall is formed (fig. 16), and by further deposition of chromatic material about the same granules in the direction of the pole of the spore a vesicle is produced (fig. 17).

This vesicle, which represents the embryo, grows towards the middle of the spore and in consequence of its further development, the wall of the spore splits (fig. 19), the opening becomes wider and the vesicle which now stains deeply, emerges (fig. 20).

At this stage of development there are in cultures a great number of empty spore-walls which always show the opening through which the embryo has emerged (fig. 21).

XXI.—MISCELLANEOUS NOTES.

Mr. A. Sharples.—We learn that Mr. A. Sharples, Assistant Mycologist in the Agricultural Department of the Federated Malay States, has been appointed Mycologist of the Department, with effect from 10th January, 1916.

Botanical Magazine for May.—The plants figured are *Rhododendron decorum*, Franch. (t. 8659), from Western China; *Penstemon rupicola*, Howell (t. 8660), from North America; *Cytisus ratisbonensis*, Schaeff. (t. 8661), which occurs from Central Europe to Siberia, and *Eria tomentosa*, Hook. f., a native of Indo-China.

Phoenix canariensis.—This palm has been known for many years, notably on the Riviera, for its ornamental qualities. It was described as *P. dactylifera*, var. *Jubae*, by Webb and Berthelot (Hist. Canar. iii. Phytog. iii. 289, 1845-8), who gave a reference to it in Pliny's History under the name of *Palmeta caryotas ferentia*. As a cultvated plant it was mentioned as *P. caryotas*, Hort., in Verschaffelt's Catalogue for 1869, 13, and did not receive the name of *P. canariensis*, Hort., until 1882. It has proved hardy at Montevideo, and in California it is planted by the sides of roads, where it has superseded *P. reclinata*, Jacq. The following is its synonomy:—

P. canariensis, Hort. ex Chaubaud in La Provence Agric. No. 19, 293, figs. 66-68 (Oct. 1882); Becc. in Malesia, iii. 347, 369, t. 43, fig. 2; Rev. Hort. 1885, 541, 1888, 180, and 1893, 126, figs. 46 and 49; Ill. Hort. xxxiii. 8; Le Jardin, 1887, 67, fig. 26; Gard. Chron. 1894, xv. 405, fig. 50, and 1902, xxxii. 81, with fig.; Rev. Hort. Belg. 1911, 332. *P. dactylifera*, var. *Jubae*, Webb & Berth. Hist. Canar. iii. Phyt. iii. 289. *P. tenuis*, Hort. ex Verschaff. Catal. 1869, 13, with fig. *P. Vigieri*, Hort. ex Rev. Hort. 1888, 180. *P. Jubae*, Christ in Engl. Bot. Jahrb. vi. 469, and ix. 170.

This species can be separated from its allies thus:—

Female corolla twice as long as the calyx:
- Suckers present. Fruit cylindrical; pericarp fleshy and sugary ... ... *P. dactylifera*, Linn.
- Stem solitary. Fruit oblong-elliptic; pericarp scarcely fleshy ... ... *P. sylvestris*, Roxb.

Female corolla scarcely longer than the calyx. Stem solitary, very thick. Fruit globose-ovoid; pericarp scarcely fleshy ... ... *P. canariensis*, Hort.

A hybrid has been raised between the last two. In addition to the ornamental value of this palm, Dr. G. V. Perez, of Tenerife, has in a recent letter made the following comments upon its uses:—

(1) Probably the best windbreak for plantations known, and

one of the few which will successfully stand sea-winds, and a considerable amount of salt in the soil.

(2) An ideal tree to plant along river banks, to avoid erosion of the soil.

(3) The hard kernels are admitted in this very village [Santa Ursula] to be one of the best and most fattening foods for pigs; it is also well known to be relished by goats, and neither of these two animals seems to mind in the very least the great hardness of the kernels; some years ago I fattened a turkey most successfully on these dates, or kernels, as they are practically all kernels with little more than skin over them. Dr. Perez mentions that he is at present feeding a milch cow with the kernels after steeping them in water for a few days.

(4) The inhabitants of Gomera make a wonderful use of the Canary Palm by carefully tapping its sap and making a most valued and abundant beverage, also a sort of honey, which all prove the great richness in saccharine substance of our palm.

According to the historian of the Islands, Don José de Viera, y Clavijo, a single palm yields a barrel of palm honey, this being the concentrated syrup obtained by heating the palm sap.

Don Pedro del Castillo, who wrote his history of the Islands in 1706, states that the Guanches (Aborigines) of Gomera, before the Spanish conquest of the islands, were in the habit of tapping the thousands of palms in that island. If this be true it would appear to confirm the belief that the Guanches introduced the practice from the opposite coast of Africa, where the tapping of palms is largely practised, and either therefore the Guanches came originally from Africa or the custom was introduced thence.

Dr. Perez adds that in the island of Gomera, which is famous among other things for the fact of Columbus having lived in it for a long time before he discovered the New World, palms have been from time immemorial an object of economic exploit. The genuine date palm, Dr. Perez suspects, must have been imported from the neighbouring oasis by the frequent raids which the first Spanish Lords of the island were well known to have made into the facing coast of Morocco, when there was even a fort under their rule (Santa Cruz de "Mar Pequeña").

In these numerous raids they brought back the famous Atlas Stag which, till a century ago, was a well-known object in the virgin forests of Gomera, the red-legged partridge, unknown in the islands before the raids of the Spanish Lords, and also the splendid Arab ponies which till quite lately were the admiration of all travellers who visited Gomera.

A Method of Macerating Fibres.—It is necessary when examining vegetable fibres to be able to isolate the component elements of the fibrous strands, *i.e.*, to macerate the material. After maceration the measurements and other characters of the individual elements can be easily determined.

There are several methods of macerating plant-tissues. One of these often employed in botanical laboratories, *e.g.*, for studying

the structure of wood, depends on the use of nitric acid and chlorate of potash (Schulze's macerating mixture). This reagent can be used for fibres, but its action is slow unless heat is applied, and in the latter case the acid fumes given off are a drawback to the method.

Among other reagents which have been recommended for macerating fibres are solutions of caustic potash and chromic acid, the material being either boiled in the potash solution or soaked in cold chromic acid solution. Different details of treatment are given by different writers as regards the strength of the solutions to be used and the time requisite for maceration.*

As a strong solution is normally more energetic in action than a weak one, maceration is more rapid in the former. Though convenient in causing quick maceration, a strong solution has the disadvantage that its action may readily become too general. Thus, if concentrated chromic acid be used, the removal of the middle lamellas (which causes maceration of the specimen) may not be completed before the other parts of the cell-walls begin to be attacked.† In such cases portions of the walls may be dissolved away, or the fibres may all become very fragile. With potash solution too severe treatment may cause considerable swelling of the cell-walls.

A convenient method thus requires the use of a reagent which is strong enough to be fairly quick in producing maceration without causing appreciable alteration in the isolated fibrous elements. These requirements are not easily fulfilled. Since some fibres are decidedly more resistant to maceration than others, a uniform strength of reagent and time of treatment cannot be expected to be successful in all cases. As a regular procedure, however, a generally efficient strength of solution may be adopted, and some of the fibre-material may be examined at intervals during maceration, so that the treatment may be stopped at the right time.

In experimenting with some modifications of the usual methods it was found that a combination of the use of potash and of chromic acid has advantages in the ease with which a good result is generally obtained. The method therefore appears to be worth describing.

The reagents used are a 10 per cent. aqueous solution of caustic potash, and a solution of chromic acid made by adding one part of a saturated watery solution of chromic acid to four parts of water.‡ A small amount of the fibre is first boiled for about four minutes in the potash solution§, then rinsed in water, and afterwards soaked in the chromic acid for five or ten minutes. The fibre may by that time be sufficiently macerated. If so, it is found to be limp, and may be gently transferred to a vessel of

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* See Herzog, Microphot. Atlas d. technisch wichtigen Faserstoffe (1908), p. 16, and other works on fibres referred to by Herzog on p. 41.

† Material to be treated, if not already in the form of hair-like strands, should be sliced into rather thin strips.

‡ In some experiments one part of saturated chromic solution to three of water was used, and worked satisfactorily. It is perhaps better however to employ the weaker solution and strengthen it if necessary.

§ Certain kinds of fibres are satisfactorily macerated by this treatment with potash alone, and do not require the chromic acid.

water, in which it is left for a short time to remove the chromic acid. It is then placed in a test-tube half-full of water and shaken up with some vigour, after which as a rule the constituent elements will be found to be completely separated.

If the material has not become sufficiently limp after ten minutes in the chromic acid, the solution may be strengthened by adding a little saturated solution to it, and the fibre may be tested again for softness a few minutes later.

Several samples of commercial fibres were treated by the method described above, and proved to be well macerated either after five or ten minutes in the chromic acid, or after a few additional minutes in a slightly stronger solution. In this treatment it was not found that the walls of the fibres were either swollen by the potash or attached by the chromic acid.*

For certain classes of fibres it would no doubt be better to use a somewhat different treatment, but the above method appears, after a number of trials, to be suitable for fairly general use with fibres. When in any case it is found that the action has been too weak or too strong, it is easy to alter the treatment in the right direction for a second attempt.

Maceration of wood was tried by the same method, but the results were much less satisfactory than those obtained with fibres.

L. A. B.

Tulipa Wilsoniana.—A case of polyphylly has occurred in *Tulipa Wilsoniana*, Hoog., grown at Kew, two flowers of which have become regularly tetramerous. The perianth consisted of eight segments arranged in two whorls, in each of which two were external in bud, while those alternating with them were inside, thus resembling the aestivation of *Papaveraceae*. In one flower the segments were quite regular, but in the other larger one there was a slight irregularity in their size combined with a tendency to become lobed along their sides. The eight stamens were all perfect. The four stigmas in one flower diverged at equal angles, but in the other two of the rays were slightly nearer together than the remainder. The ovary was completely four-celled with two rows of perfect ovules in each cell. The typical plant, which comes from the south-west of Aschabad and is named after the late Mr. G. F. Wilson, has been figured in the Gardeners' Chronicle, 1901, vol. xxix., p. 327, fig. 121, and in the Revue Horticole, 1903, p. 206.

C. H. W.

Potato Disease Investigations.—A paper of considerable importance to those interested in potato diseases has recently been published by Dr. G. H. Pethybridge. The paper is the outcome of an investigation—extending over six years—of the potato disease caused by the fungus *Verticillium albo-atrum*, R. & B. The work has been carried out, partly at the experiment

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* Except that in one or two cases the fibres had become somewhat brittle. They were then liable to break across if shaken up with a good deal of energy.

station at Clifden, Co. Galway, which during its short existence has contributed so much to our knowledge of potato diseases, and partly in Dublin.

The *Verticillium* potato disease was described by Reinke and Berthold as long ago as 1879, and was stated by them to be the cause of the well-known malady of potatoes known as "Leaf Curl." Since then many workers have investigated the "Leaf Curl" problem, and a mass of literature has accumulated which is, however, of a most confusing and conflicting nature. The various writers have attributed utterly different fungi as being the cause of "Curl" and the allied "Leaf Roll" (in England *Macrosporium Solani* was usually considered mainly responsible), while others vigorously maintained that the disease was non-parasitic, and due to physiological disturbances in the plant.

Dr. Pethybridge's prolonged and careful study of *Verticillium albo-atrum* is of special value in showing exactly what the fungus is usually responsible for, and, further, what it is capable of accomplishing. It is, moreover, the first detailed study of a "Curl" disease in the British Isles. Pethybridge finds that, in the main, Reinke and Berthold were correct, but shows that "curl" is not by any means a constant feature of the *Verticillium* disease. He also corrects several errors made by them, and shows how the difficulties and discrepancies they encountered may be explained.

The mycelium of the fungus is found in the vascular bundles only, and it is confined in them to the wood vessels. With the sprouting of the tuber the mycelium passes along the vessels into the new shoots, though sometimes not until the latter have made considerable growth. Hence though the potato plants may often show the typical symptoms of *Verticillium*, no mycelium will be found in the stem, except at the extreme base. In later stages the mycelium may advance up the shoots and be traced in the vessels of the petioles and leaves, though in cases of bad infection the water-conducting tissues become so blocked that the plants wither and die off early in the season.

From the base of the shoots the mycelium also passes into the wood vessels of the rhizomes and from these into the new tubers. Pethybridge's experiments show that, contrary to the view held by Reinke and Berthold, the mycelium, even in the autumn, penetrates well towards the rose-end of the tubers and that during winter it advances further, a discovery which obviously renders control less easy than was previously thought. He also states that no reliance can be placed on the absence of a dark ring in the tuber as a proof of clean seed.

The fungus grows well in pure culture as a saprophyte, and infection experiments on healthy plants carried out with pure cultures were successful in reproducing the disease. In the field infection is without doubt carried on by the tubers, and it is not known how primary infection might occur under natural conditions. For controlling the disease clean "seed" is, of course, essential.

An attack of *Verticillium albo-atrum* results in the more or less premature death by desiccation of the plant owing to the choking

up of the wood vessels with mycelium. For this reason Pethybridge regards it as a type of wilt disease, though the wilting of the foliage is rare in Ireland, and he suggests that it should be removed from the category of "Curl" and "Roll" diseases, and be regarded as a type characterised by the wood vessels being infested by mycelium, for which he suggests the term *hadromycosis*.

Much still remains to be learned as to the other sources of Leaf Curl and Leaf Roll, but it is highly satisfactory to have a full and careful account of Reinke and Berthold's *Verticillium* disease which has hitherto received very scant attention in the British Isles. A. D. C.

Plants in Health and Disease.—A small work under the title "Plants in Health and Disease" has recently been issued by the Manchester University Press. The volume represents an abstract of a course of lectures designed especially for small gardeners and allotment holders, and delivered at Manchester University during 1915–1916.*

The first seven lectures were given by Prof. F. E. Weiss, and deal with the structure and life of plants in normal health. The last ten, five each by Mr. W. Robinson and Dr. A. D. Imms, deal with diseases of plants caused by fungi and animals respectively.

As is emphasised in the introduction it is clearly impossible within the scope of seventeen lectures to deal in any but the briefest way with any of the subjects chosen, but, in spite of this, the size of the audiences and the interest aroused appeared to warrant the publication of the weekly abstracts in book form.

The lectures are simply and clearly worded, and not burdened with technical terms. In those on disease a few important types are selected and described. They deal especially with animal and fungous pests found in the Manchester neighbourhood, and hence, though applicable to gardens in any industrial area, are perhaps more specially suitable for readers in the north of Britain. A. D. C.

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* The University Press, Manchester, 1916. Longmans, Green & Co. 8vo. pp. 143. Price 1s. 6d.